

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of: Divakaruni et al. **Conf. No.:** 1387
Serial No.: 10/707,388 **Art Unit:** 2891
Filed: 12/10/2003 **Dkt. #:** FIS920030274US1 (IBMF-0032)
Title: SILICIDE RESISTOR IN BEOL
LAYER OF SEMICONDUCTOR
DEVICE AND METHOD **Examiner:** Fulk, Steven J.

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Commissioner for Patents
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PRE-APPEAL BRIEF REQUEST FOR REVIEW

Sir:

Applicants respectfully request a panel of experienced examiners perform a detailed review of appealable issues for the above-identified patent application pursuant to the Pre-Appeal Brief Conference Pilot Program. Notice of Appeal has been filed together with this Request.

Applicants submit that the above-identified application is not in condition for appeal because the After-final rejection is defective in facts and in law. Claims 1-20 are pending in this application, among which claims 1-11 are withdrawn from consideration.

In the Final Office Action (OA), claims 12 and 19-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Buskirk (US 2003/0122175); and claims 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buskirk in view of Wolf, *Silicon Processing for the VLSI Era*, 1990, Volume II, page 146, hereinafter “Wolf.” Applicants submit that these rejections are clearly not proper and without basis for the reasons stated below.

With respect to independent claims 12 and 20, for example, Applicants submit that Buskirk does not disclose, *inter alia*, “the silicide section has a silicidation temperature less than a damaging temperature of the plurality of BEOL layers.” (Claim 12; similarly in claim 20). Buskirk mentions silicides as moderate or low conductivity materials (*see ¶ 0013*), but only describes use of TaN or Ta as materials for conductor 30. (*See ¶ 0020*) Buskirk does not disclose the type of the silicide, does not disclose how to form a silicide section, and does not disclose a silicidation temperature. In this regard, Buskirk is non-enabling for the recited silicidation temperature. Consequently, Applicants submit that the Office’s conclusion is factually and legally faulty.

In the Final Office Action, the Office also asserts that “[i]t is inherent that the silicide resistor had a silicidation temperature less than a damaging temperature of the plurality of BEOL layers in light of the fact that the structure is built and operates as intended, thereby meaning the BEOL layer 20 was sufficiently undamaged during the silicide formation process.” (OA at page 3, emphasis added). The Office basically repeats the same arguments in the Advisory Action of 2/21/07 (AA) by asserting that “the fact that Buskirk’s resistor is fully functional as intended is evidence that the BEOL layers are not damaged during the formation of the silicide section.” (AA at page 3). Applicants respectfully disagree because Buskirk does not necessarily include the above feature.

The logic of the Office is that because Buskirk mentions a silicide and the Buskirk structure is “fully functional” (AA at page 3, emphasis added), the BEOL layer 20 must be not damaged during a formation of the silicide section. And because the BEOL layer 20 was not damaged during the silicide formation, a silicidation temperature in Buskirk must be lower than a

damaging temperature of BEOL layer 20. Applicants respectfully submit the Office's inherency argument is faulty for the following reasons:

(1) Buskirk uses an enhancement layer 26 and, optionally, a barrier/adhesion layer 28 (see, e.g., ¶ 0020 and FIG. 1F) between conductor 30 and BEOL layer 20. Applicants submit that it is unlikely that Buskirk would be worried about the silicidation temperature relative to a damaging temperature of BEOL layer 20 because layers 26 and 28 prevent the silicidation temperature from affecting BEOL layer 20. The Office ignores the existence of these layers in making its inherency argument.

(2) Even if the Buskirk structure were fully functional, assumed for sake of argumentation, the BEOL layer 20 is not necessarily free from damage during silicidation. For example, it is possible that BEOL layer 20 is damaged and the structure is still functional or that BEOL layer 20 is damaged and repaired so that the structure is fully functional. Since Buskirk only passively mentions use of silicides, it is impossible to know. As a result, it is incomprehensible how the Office can conclude that Buskirk anticipates the claim without more description. The Office is simply making too many assumptions for an inherency argument.

(3) Even if the BEOL layer 20 were not damaged during the formation of the silicide section, a silicidation temperature in Buskirk is not necessarily lower than a damaging temperature of layer 20. Other methods may also achieve a BEOL layer 20 that is not damaged without having a silicidation temperature lower than a damaging temperature of BEOL layer 20. For example, layer 20 may be protected by enhancement layer 26 and/or barrier layer 28 during the silicidation process. Again, the Office is simply making too many assumptions based on a passive disclosure of the use of silicide in Buskirk.

In the Advisory Action, the Office asserts that claims 12 and 20 “invokes the product-by-process doctrine” and that “anticipation of claim 12 only requires the structural limitations of a resistor comprising a silicide section and a plurality of BEOL layers that are not structurally damaged when forming the silicide section.” (AA at pages 2-3). Applicants respectfully disagree because the claimed silicidation temperature of the silicide section is a physical characteristic of the materials that make up the silicide, not a process step. As such, anticipation of claim 12 requires disclosure of the claimed silicidation temperature, which is missing from Buskirk.

In view of the foregoing, the reasoning of the Office is factually and legally defective; Buskirk does not disclose, *inter alia*, “the silicide section has a silicidation temperature less than a damaging temperature of the plurality of BEOL layers[,]” as included in the claimed invention. As such, the rejections are defective because they are not based on fact and/or technical reasoning as required by law, and the application is not ready for appeal. The dependent claims are considered allowable for the same reasons, as well as for their own additional features.

In view of the foregoing, Applicants submit that this application is not in condition for appeal and should either be allowed as is, or re-opened for further prosecution.

Respectfully submitted,

/Spencer K. Warnick/

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